FIG. 17 is a view of the distal end of a Type "D" probe that carries first and second PTC components to provide an alternative form of energy application to tissue.

FIG. 18 is a sectional view of the Type "D" probe of FIG. 17.

FIG. 19 is a sectional view of an alternative Type "D" probe with a gradient type of PTC component to provide form of energy application to tissue.

FIG. 20 is a plan view of the distal end of a Type "E" probe that has an open cell compressible PTC component for providing fluid flow to the engagement plane.

FIG. 21 is a sectional view of the Type "E" probe of FIG. 20.

FIG. 22 is a cut-away view of an alternative Type "E" probe with an openable-closeable jaw structure.

FIG. 23A is a schematic view of an open cell compressible PTC component similar to that of FIG. 22 in a non-compressed condition.

FIG. 23B is a schematic view of the open cell compressible PTC component of FIG. 23A in a compressed condition.

FIG. 24 is a cut-away view of the distal end of a Type "F" probe that has a DC source coupled to the medial conductive portion.

FIG. 25 is a view of the working end of a Type "G" probe corresponding to the invention that comprises a distal end of a catheter carrying a negative temperature coefficient material.

FIG. 26 is a sectional view of the Type "G" probe of FIG. 25 showing its use in a fluid environment.

FIG. 27 is a view of the working end of an alternative Type "G" probe corresponding to the invention that carries a pressure-sensitive resistive layer and further showing its method of use for shrinking collagen in joint capsule.

DETAILED DESCRIPTION OF THE INVENTION

1. Type "A" probe for tumor ablation. An exemplary Type "A" probe **100** of the invention is illustrated in FIGS. 2 and 3 that is adapted for energy delivery to tissue, such as a targeted benign or malignant tumor. The probe **100** includes a proximal handle portion indicated at **106** and an introducer portion **110** that can be rigid or flexible in any suitable diameter. For example, the introducer portion **110** can be a diameter ranging from about 1 mm. to 5 mm. for use in percutaneous procedures or endoscopic procedures. The introducer portion extends from a proximal end **112a** to a distal end **112b** relative to longitudinal axis **115** and defines a bore **118** extending therethrough. The distal termination **112b** of introducer **110** can be sharp for tissue penetration, as shown in FIGS. 2 and 3. In another embodiment, the introducer **110** can have a rounded distal end for introduction through a body passageway or lumen, such as an elongate catheter for endoluminal introduction. In another embodiment (not shown), an introducer portion may not be needed and the energy delivery member **120** (FIG. 4) of the invention can be used independently, for example in a needle-type probe for percutaneous access to targeted tissue site.

In the exemplary embodiment of FIGS. 2 and 3, the energy delivery member **120** corresponding to the invention comprises an element that is extendable from the distal end **112b** of the introducer portion for contacting tissue. The energy delivery member **120** typically has a working end **122** with a sharp distal termination **123** for tissue penetration as shown in FIG. 3, but it should be appreciated that other embodiments of the inventive working end and working surface are possible to delivering energy to tissue in contact with the working end—whether the targeted tissue is subsurface tissue or surface tissue.

More in particular, referring to FIG. 3, the working end **122** of the energy delivery member defines an exterior engagement surface or engagement plane **125** that contacts and delivers energy to a targeted tissue. For example, FIG. 4 generally depicts a sectional view of a tissue mass with a targeted tumor tissue **tt** therein. The working end **122** is inserted through the targeted tissue **tt** that is below the surface **s** of the organ or skin. For example, the tumor tissue can reside in a patient's liver. In this embodiment, the cross-section of the energy delivery member **120** is round and is

formed as a needle having a diameter ranging from about 0.05" to 0.25". It should be appreciated that the energy delivery member **120** can have any other cross-sectional shape, such as oval or rectangular.

In the exemplary embodiment of FIG. 3, the engagement surface or plane **125** that delivers energy to tissue extends an axial length **L** (from proximal surface end **126a** to distal surface end **126b**) along the member **120** as well as 360° around the circumference of the member. The dimensions of the engagement surface or plane **125** can comprise the entire exposed surface of the working end **122** or any radial portion thereof or a plurality of radial or axial portions thereof. As one example, the engagement plane **125** can comprise only one surface on one side of the member **120** (see FIGS. 8-10A).

The sectional view of FIG. 5 more particularly illustrates the working end components of the invention for controllably delivering energy to tissue. The engagement surface or plane **125** of working end **122** is fabricated of a (first) conductive surface or material indicated at **140A** that is both electrically conductive and thermally conductive and can be any suitable material known in the art (e.g., gold, platinum, palladium, silver, stainless steel, etc.). As shown in FIG. 5, the first conductive surface **140A** can have any suitable thickness dimension $\mathbf{d_1}$ and can comprise a thin-wall sleeve or alternatively a thin film deposit in the order of .001" to .005" on member **120**, or in some cases can simply comprise a surface layer portion of the next described interior layer **140B**.

As can be seen in FIG. 5, an interior of working end **122** carries a medial (second) conductive material or layer indicated at **140B** and an inner (third) conductive material or electrode **140C** at a core of the member **120**. Each of the medial and inner conductive layers, **140B** and **140C**, has any suitable cross-sectional dimension indicated at $\mathbf{d_2}$ and $\mathbf{d_3}$, respectively. Preferably, the cross-sectional dimension of the medial (second) conductor **140B** and inner (third) conductor **140C** comprise a substantial fraction of the mass of the working end **122** to provide a thermal mass for optimizing passive conduction of heat to tissue as will be described below. The innermost or third conductive material **140C** at the core of member **120** comprises an electrical conductor (or electrode) and is coupled by an electrical lead to a remote Rf source **150A** and optional controller **150B**. It can be further understood from FIG. 5 that the inner (third) conductive material **140C** is coupled to, or immediately adjacent to, the medial (second) conductive material **140B** for